

WHAT IS CLAIMED IS:

1. Transition metal compounds having at least two ligands and at least one donor-acceptor interaction between the ligands, wherein at least one ligand is a fluorenyl ligand and the transition metal compound has at least one alkyl or aryl group on at least one acceptor atom.
2. Transition metal compounds according to Claim 1, wherein the second ligand is a cyclopentadienyl ligand.
3. Transition metal compounds according to Claim 1, wherein the acceptor group contains an acceptor atom from group 13 of the Periodic Table of the Elements (IUPAC 1985).
4. Transition metal compounds according to Claim 1, wherein at least one acceptor atom has dialkyl or diaryl substituents.
5. Transition metal compounds according to Claim 1, wherein at least one acceptor atom has diethyl or diphenyl substituents.
6. A catalyst comprising the transition metal compounds according to Claim 1.
7. A reaction product prepared by reacting a cocatalyst and transition metal compounds according to Claim 1.
8. A process for the homopolymerization or copolymerization of one or more olefins, cycloolefins, isoolefins, alkynes or diolefins monomers comprising the step of admixing one or more monomer in the presence of at least one transition metal compound according to Claim 1 and optionally one or

more cocatalyst, wherein the process is carried out at a temperature from about -60 to about +250°C.

- 5 9. A process for ring-opening polyaddition comprising the step of admixing one or more monomer in the presence of at least one transition metal compound according to Claim 1 and optionally one or more cocatalyst, wherein the process is carried out at a temperature from about -60 to about +250°C.
- 10 10. Process according to Claim 8, wherein the transition metal compounds are applied to a support material.
11. Process according to Claim 9, wherein the transition metal compounds are applied to a support material.
- 15 12. Process according to Claim 8, wherein the polymerization is carried out in the temperature range from 10°C to 100°C.
- 20 13. Process according to Claim 12, wherein the polymerisation is carried out in the temperature range 20° to 90°C.
14. Process according to Claim 13 wherein the polymerisation is carried out in the temperature range from 30°C to 80°C.
- 25 15. Process according to Claim 8, wherein the ratio of cocatalyst to transition metal compound is in the range $\leq 100,000:1$.
16. Process according to Claim 15, wherein the ratio of cocatalyst to transition metal compound is in the range $\leq 10,000:1$.

17. Process according to Claim 16, wherein the ratio of cocatalyst to transition metal compound is in the range, $\leq 1,000:1$.
18. Process according to Claim 17, wherein the ratio of cocatalyst to transition metal compound is in the range $\leq 300:1$.
19. Process according to Claim 8, wherein the polymers produced have a bimodal molar mass distribution, and wherein percentage ratio of the two polymer fractions is controlled by means of the temperature.
20. Process according to Claim 8 further comprising the presence of a second transition metal compound with or without a donor-acceptor interaction, wherein the polymers produced have a bimodal mass distribution and wherein percentage ratio of the two polymer fractions is controlled by means of the ratio of the transition metal compounds used.
21. A process for preparing an elastomer comprising the step of admixing one or more monomer in the presence of at least one transition metal compound according to Claim 1 and optionally one or more cocatalyst, wherein the elastomer has an $M_n \geq 5 \cdot 10^4$ g/mol.
22. A process for preparing a polyolefin comprising the step of admixing one or more monomer in the presence of at least one transition metal compound according to Claim 1 and optionally one or more cocatalyst, wherein the polyolefin has an $M_n \geq 5 \cdot 10^4$ g/mol.
23. The process according to Claim 22, wherein the elastomer is an elastomeric polypropylene.

24. The process according to Claim 22, wherein the elastomer prepared is selected from the group consisting of EPDM, EBDM, EHDM, EODM or mixtures thereof.
- 5 25. The process according to Claim 22, wherein the elastomer has long-chain branching.
26. The process according to Claim 22, wherein the elastomer prepared has bimodal or multimodal molecular weight distribution.